

EFFECTS OF FLOW ON THE MIGRATORY BEHAVIOIR
AND SURVIVAL OF JUVENILE FALL AND SUMMER
CHINOOK SALMON IN JOHN DAY RESERVOIR

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INTRODUCTION

In 1985, the National Marine Fisheries Service (NMFS), under contract to the Bonneville Power Administration (BPA), began to evaluate adult returns from 0 age summer and fall chinook salmon released in the McNary Dam tailrace from 1981 to 1983. These fish were released as part of a study initiated in 1981 to define the effects of instream flows on the passage time, migrational behavior, and survival of 0 age chinook salmon migrating through John Day Reservoir from June through August. They also served as controls for releases transported from McNary Dam and released below Bonneville Dam by the NMFS transportation and homing studies project (project funded by the U.S. Army Corps of Engineers). A final report covering the 3 years of juvenile studies in the reservoir (passage time and migrational behavior) has been completed for submission to BPA and a professional journal.

Chinook salmon may return from the ocean in 1 to 4 years, with the bulk of fish as 3 ocean returnees. Consequently, the full complement of adult return data is not available at this time. The last returnees from the final (1983) releases will not return to the river as 4 ocean fish until the fall of 1987. Coded wire tag (CWT) data from these fish will not be available until at least the spring of 1988. Trends are apparent, however, in the data collected so far. This report will treat adult returns through 1984 and discuss, in general, results to date.

METHODS

Early, middle, and late migrating segments of the 0 age chinook salmon migration entering John Day Reservoir were collected at McNary Dam, coded wire tagged, freeze branded, and released in the tailrace below the dam in 1981,

1982, and 1983. The releases totaled 77,082 fish with three CWT groups in 1981 (15 June to 26 August), 61,869 fish with four CWT groups in 1982 (24 June to 3 September); and 72,559 fish with five CWT groups in 1983 (16 June to 2 September).

Returning salmon with CWT were recovered by tag detection equipment operating in fishways at Bonneville, McNary and Lower Granite Dams. Additional tagged and adipose clipped adults were recovered at hatcheries, from spawning grounds, in the ocean, Columbia and Snake River sport fisheries, and from the varied ocean and river commercial fisheries.

RESULTS

1981 Releases

Three years of adult return data have been collected for the 1981 release groups. Only the 4 ocean fish which are returning in the fall of 1985 remain to be processed. We expect that the 4 ocean fish will contribute relatively little to the overall returns and that patterns discussed here will not change dramatically with the inclusion of the 4 ocean fish at a later date.

A total of 117 adult fall chinook salmon from the 1981 releases in the McNary Dam tailrace were recovered from 1982 through 1984--26.5% from the ocean fisheries and 73.5% from the river fisheries, traps, hatcheries, and spawning grounds (Table 1). The total rate of return was 0.15X. The early (25 to 29 June), middle (10 to 29 July), and late (10 to 26 August) segments of the outmigration returned at rates of 0.169, 0.183, and 0.053%, respectively. The data to date suggest that the late segment of the outmigration may be contributing less to the fisheries and fewer adult returns to the river than the earlier releases. Any conclusions drawn at this time,

Table 1.--Summary of 0-age chinook salmon wire-tagged, cold branded, and released in the McNary Dam tailrace (16 June to 26 August 1981) and recovered as adults from 1982 to 1984.

	Recoveries, CWT 031731 ^{a/}					Recoveries, CWT 031732 ^{b/}					Recoveries, CWT 031730 ^{c/}				
	Number				%	Number				%	Number				%
	1982	1983	1984	Total	return	1982	1983	1984	Total	return	1982	1983	1984	Total	return
Ocean fishery															
Alaska	2	0	0	2	0.011	0	0	1	1	0.002	0	0	0	0	0.000
British Columbia	0	5	7	12	0.067	1	4	6	11	0.025	1	0	2	3	0.011
Washington	0	0	0	0	0.000	0	0	1	1	0.002	0	0	0	0	0.000
Oregon	0	0	0	0	0.000	0	0	1	1	0.002	0	0	0	0	0.000
River commercial	0	1	1	2	0.011	0	0	9	9	0.021					
Bonneville hatchery	0	0	0	0	0.000	0	0	1	1	0.002	0	0	0	0	0.000
Bonneville trap	0	0	5	5	0.028	1	0	23	24	0.056	0	0	2	2	0.011
Full Indian fishery	0	0	5	5	0.028	0	5	13	18	0.042	0	0	2	2	0.011
McNary trap	0	0	0	0	0.000	4	0	1	5	0.011	2	0	0	2	0.011
River sport															
Col. R. above Snake R.	0	0	1	1	0.005	0	0	0	0	0.000	0	0	0	0	0.000
Priest Rapids Hatchery	1	0	0	1	0.005	1	0	0	1	0.002	0	0	0	0	0.000
Stream survey	0	0	2	2	0.011	1	2	2	5	0.011	0	0	0	0	0.000
Lower Granite trap	<u>0</u>	<u>0</u>	<u>0</u>	0	<u>0.000</u>	1	<u>0</u>	<u>0</u>	<u>1</u>	<u>0.002</u>	0	0	<u>0</u>	0	<u>0.000</u>
Total	3	6	21	30 ^{d/}	0.169	9	11	58	78 ^{d/}	0.183	3	0	6	9 ^{d/}	0.053

^{a/} 17,723 tagged fish released 15-29 June 1981.

^{b/} 42,580 tagged fish released 10-29 July 1981.

^{c/} 16,779 tagged fish released 10-26 August 1981.

^{d/} Of all fish tagged (77,082) 0.15X (117) have been recovered.

would be very speculative. Until the full complement of adult returns from all three release years is available, a comprehensive analysis is impossible. Specific dates, gear recovery location, and fish length for each tag recovery are detailed in Appendix Table A1.

1982 and 1983 Releases

Most of the adults from the 1982 and 1983 release groups have not as yet returned. There are only 2 years of adult data available for 1982 and a single year for the 1983 releases (Tables 2 and 3). Through 1984, a total of 37 and 20 tag returns have been collected for the 1982 and 1983 releases, respectively. Specific dates, gear, location, and fish length for each tag recovery are detailed in Appendix Table A1.

ACTIVITIES FY86

In 1986, we will continue to accumulate and evaluate tag return data as they become available. We expect a considerable increase in tag returns from the run of fall chinook salmon presently migrating through the Columbia River. Projections regarding the magnitude of the 1985 run are encouraging and indicate this is one of the larger runs in recent years. Consequently, we expect to acquire substantial numbers of 3 and 2 ocean returnees from the 1982 and 1983 release groups, respectively. However, the full complement of adult return data will not be complete until the 4 ocean returnees from the final (1983) releases groups arrive in the fall of 1987. The coded wire tag data from these fish will not be processed and available until at least the spring of 1988. We, therefore, expect to submit the completion report in the fall of 1988.

Table 2.--Summary of 0 age chinook salmon wire-tagged, cold branded, and released in the McNary Dam tailrace (24 June to 3 September 1982) and recovered as adults from 1983 to 1984.

		Recoveries, CWT 231611 ^a				Recoveries, CWT 231609 ^{b/}				Recoveries, CWT 231613 ^{c/}				Recoveries, CWT 231615 ^{d/}			
		Numbers		%		Numbers		%		Numbers		%		Numbers		%	
		1983	1984	Total	return	1983	1984	Total	return	1983	1984	Total	return	1983	1984	Total	return
Ocean fishery																	
Alaska		1	0	1	0.01	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
British Columbia		0	2	2	0.02	1	2	3	0.02	0	0	0	0.00	0	0	0	0.00
Ocean sport		0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	1	0	1	0.01
River commercial		0	0	0	0.00	0	1	1	0.01	0	1	1	0.01	0	0	0	0.00
Bonneville	trap	0	5	5	0.05	2	6	8	0.04	3	5	8	0.05	0	0	0	0.00
All Indian fishery		0	0	0	0.00	0	0	0	0.00	0	1	1	0.01	0	0	0	0.00
McNary	trap	0	1	1	0.01	1	0	1	0.01	0	0	0	0.00	2	0	2	0.01
Stream survey		0	0	0	0.00	0	0	0	0.00	0	1	1	0.01	0	0	0	0.00
Lower Granite	trap	<u>0</u>	<u>0</u>	<u>0</u>	<u>0.00</u>	0	<u>0</u>	<u>0</u>	<u>0.00</u>	0	<u>1</u>	<u>1</u>	<u>0.01</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0.00</u>
Total		1	8	9 ^{e/}	0.09	4	9	13 ^{e/}	0.08	3	9	12 ^{e/}	0.09	3	0	3 ^{e/}	0.02

^{b/} fish released 24 tagged - July 1982.

^{c/} 18,383 tagged fish released 13-22 July - 1982.

^{d/} 16,723 tagged fish released 27 Jul - 13 Aug 1982.

^{e/} 17,635 tagged fish released 17 Aug 3 Sep 1982.

Of all fish tagged (61,869) 0.06% (37) have been recovered.

Table 3.--Summary of 0 age chinook salmon wire-tagged, cold branded, and released in the McNary Dam tailrace (16 June to 2 September 1983) and recovered as adults in 1984.

	Recoveries CWT 231623 ^{a/}			Recoveries CWT 231633 ^{b/}			Recoveries CWT 231630 ^{c/}			Recoveries CWT 231627 ^{d/}			Recoveries CWT 231624 ^{e/}		
	Number		%	Number		%	Number		%	Number		%	Number		%
	1984 Total	return		1984 Total	return		1984 Total	return		1984 Total	return		1984 Total	return	
Ocean fishery															
British Columbia	0	0	0.00	0	0	0.00	1	1	0.00	1	1	0.00	0	0	0.00
Bonneville trap	3	3	0.03	1	1	0.02	3	3	0.01	5	5	0.02	0	0	0.00
McNary trap	0	0	0.00	0	0	0.00	1	1	0.00	2	2	0.01	0	0	0.00
Priest Rapids trap	0	0	0.00	0	0	0.00	0	0	0.00	2	2	0.01	0	0	0.00
Stream survey	1	1	0.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
Totals	4	4 ^{f/}	0.04	1	1 ^{f/}	0.02	5	5 ^{f/}	0.02	10	10 ^{f/}	0.05	0	0 ^{f/}	0.00

^{a/} 10,035 tagged fish released 16-23 Jun 1983.

^{b/} 5,010 tagged fish released on 1 Jul 1983.

^{c/} 25,035 tagged fish released A-23 Jul 1983.

^{d/} 20,105 tagged fish released 27 Jul - 12 Aug 1983.

^{e/} 12,374 tagged fish released 19 Aug - 2 Sep 1983.

Of all fish tagged (72,559) 0.03% (20) have been recovered.

APPENDIX A

Appendix Table A1.--Summary by recapture gear and location, of chinook salmon returned in 1982 through 1984 from 0 age chinook salmon released at the McNary Dam tailrace in 1981.

Coded wire tag no.	No. released	Dates released	Date recaptured	Gear	Area	Length (cm)
031731	17,723	15 - 29 Jun	29 Aug 82	Ocean commercial	Ketchikan, AK	48
			02 Aug 82	Ocean purse seine	"	41
			01 Aug 84	Non-Indian	Inside Queen	
				Ocean net	Charlotte Is. B.C.	94.5
			19 May 83	Ocean troll	"	61.3
			06 Jun 83	"	"	65
			25 Jul 83	"	Out side south	
					Vancouver Is. B.C.	N.D.*
			29 Aug 83	"	Inside Queen	
					Charlotte Is. B.C.	39
			26 Sep 83	"	Outside south	
					Vancouver Is. B.C.	N.D.
			05 Jun 84	"	Inside Queen	
					Charlotte Is. B.C.	76.6
			15 Aug 84	"	Outside North	
					Vancouver Is. B.C.	90
			20 Aug 84	"	Inside Queen	
					Charlotte Is. B.C.	85.6
			21 Aug 84	"	Outside North	
					Vancouver Is. B.C.	69.9
			05 Sep 84	"	Outside South	
					Vancouver Is. B.C.	83.6
			11 Sep 84	"	Outside North	
					Vancouver Is. B.C.	83.2
			07 Oct 83	Col. River comm.	RM 0-19.5	56.8
			20 Sep 84		RM 19.5-54	86.2

Appendix Table A1 .--Cont inued.

Coded wire tag no.	No. released	Dates released	Date recaptured	Gear	Area	Length (cm)
03173 1	17,723	15-29 Jun	11 Sep 84	Bonneville trap	Rm 145.5	75
			** Oct 84		RM 145.5	N.D.
			Oct 84		RM 145.5	N.D.
			Oct 84		RM 145.5	N.D.
			Oct 84		RM 145.5	N.D.
			03 Sep 84	Fall Indian net	RM 148-292	84.8
			03 Sep 84		RM 148-292	84.5
			03 Sep 84		RM 148-292	95.4
			12 Sep 84		RM 148-292	85.5
			19 Sep 84		RM 148-292	75.2
			12 Oct 84	Col. River sport	Hanford reach	88
			08 Sep 82	Priest Rapids Hat.	RM 397.1	47
			11 Nov 84	Stream survey	RM 397.1	98
			11 Nov 84		RM 397.1	87
031732	42,580	10 - 29 Jul	84	Ocean sport	Sitka, AK	N.D.
			14 Jul 82	Non-Indian ocean net	Queen Charlotte Strait B.C.	35
			04 Aug 83	Ocean troll	Inside Queen Charlotte Is. B.C.	60.3
			22 Aug 83		"	66.2
			09 Sep 83		"	60
			16 Sep 83		Outside south Vancouver Is. B.C.	59.3
			30 Apr 84	"	Outside north Vancouver Is. B.C.	79.7
			30 May 84	"	"	73.9

Append ix Table Al .--Cont inued .

Coded wire tag no.	No. released	Dates released	Date recaptured	Gear	Area	Length (cm)
031732	42,580	10 - 29 Jul	05 Jun 84	"	Inside Queen	
					Charlotte Is. Sound	60.4
			18 Jun 84	"	Outside south	
					Vancouver Is. B.C.	71 .S
			17 Aug 84	"	Inside Queen	
					Charlotte Is. B.C.	75.7
			07 Sep 84	"	Outside North	
					Vancouver Is. B.C.	83.8
			07 May 84	"	Grays Harbor, WA	81
			08 Aug 84	"	Astoria, OR	91
			11 Sep 84	Col. River comm.	RM 0-19.5	78
			12 Sep 84	"	RM 0-19.5	83 .R
			20 Sep 84	"	RM 0-19.5	94.4
			11 Sep 84	"	RM 19.5-54	83
			13 Sep 84	"	RM 19.5-54	88.5
			19 Sep 84	"	RM 19.5-54	86.9
			26 Sep 84	"	RM 19.5-54	77.5
			11 Sep 84	"	RM 87-129	92.1
			02 Oct 84	"	RM 129-144	78
			Oct 84	Bonneville Hat.	RM 144	N.D.
			01 Sep 82	Bonneville trap	RM 145.5	44
			16 Sep 84	"	RM 145.5	89
			19 Sep 84	"	RM 145.5	96
			23 Sep 84	"	RM 145.5	84
			23 Sep 84	"	RM 145.5	86
			Oct 84 ^{a/}	Bonneville trap	RM 145.5	N.D.

Appendix Table A1.--Continued.

Coded wire tag no.	No. released	Dates released	Date recaptured	Gear	Area	Length (cm)
031732	42, 580	10 - 29 Jul	27 Sep 83	Fall Indian net	RM 148-292	69.1
			27 Sep 83	"	"	79.1
			06 Oct 83	"	"	73.5
			06 Oct 83	"	"	69
			23 Aug 84	"	"	91
			23 Aug 84	"	"	91
			04 Sep 84	"	"	87
			04 Sep 84	"	"	68.5
			05 Sep 84	"	"	82.5
			14 Sep 84	"	"	95
			19 Sep 84	"	"	85.1
			20 Sep 84	"	"	89
			20 Sep 84	"	"	99
			20 Sep 84	"	"	94.6
			23 Sep 84	"	"	84
			28 Sep 84	"	"	72.7
			29 Sep 84	"	"	82.7
			01 Oct 84	"	"	88
			15 Aug 82	McNary trap	RM 292	40
			08 Sep 82	"	"	43.5
			09 Sep 82	"	"	49
			03 Oct 82	"	"	39
			11 Oct 84	"	"	87
			02 Nov 82	Priest Rapids Hat.	RM 397.1	48
			28 Nov 82	Stream survey	RM 397	51
			20 Nov 83	"	"	70
			20 Nov 83	"	"	74
			04 Nov 84	"	"	92
			17 Nov 84	"	"	95
			15 Sep 82	Lower Granite trap	Snake RM 107.5	40

Appendix Table A1.--Continued.

Coded wire tag no.	No. released	Dates released	Date , recaptured	Gear	Area	Length (cm)
031730	16,779	03-26 Aug	15 Jul 82	Non- Indian	Queen Charlotte	
				ocean net	Strait B.C.	35.5
			07 May 84	Ocean troll	Inside Queen	
					Charlotte Is. B.C.	88
			22 Aug 84	"	"	74
			22 Aug 84	Ronneville trap	RM 145.5	88
			28 Aug 84	"	"	88
			04 Sep 84	Fall Indian net	RM 148-292	82.8
			20 Sep 84	"	"	82
			13 Jul 82	McNary Trap	RM 292	38
			17 Jul 82	"	"	39

a/ There were a total of 19 tag recoveries at the Bonneville **trap** during October 1984. Details regarding day of recapture and length were not available from the facility.

★ N.D. - no data

★★ Fish taken from trap, delivered to Bonneville Hatchery for egg stripping. Tags delivered back to NMFS at end of October.